Sun Fire™ 6800/4810/4800/3800 Systems Overview

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Preface

This document provides the following information about the Sun Fire™ system family of servers:

- Machine configurations of the four servers
- Hardware overview
- System components
- Reliability, availability, and serviceability features

Typographic Conventions

Typeface or Symbol	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output.	Edit your `.login` file. Use `ls -a` to list all files.
`AaBbCc123`	What you type, when contrasted with on-screen computer output.	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized. Command-line variable; replace with a real name or value.	Read Chapter 6 in the *User's Guide.* These are called *class* options. You *must* be `root` to do this. To delete a file, type `rm` *filename.*

Related Documentation

Application	Title	Part Number
Installation	*Sun Fire 6800 System Installation Guide*	805-7375
	Sun Fire 4810/4800/3800 Systems Installation Guide	805-7370
	Sun Fire 4810/4800/3800 Systems Cabinet Mounting Guide	806-6781
Operation	*Sun Fire Cabinet Installation and Reference Guide*	806-2942
	Sun Fire 6800 System Getting Started	805-7374
	Sun Fire 4810/4800/3800 Systems Getting Started	805-7369
	Sun Fire 6800/4810/4800/3800 Systems Service Manual	805-7363
Software	*Sun Fire 6800/4810/4800/3800 Systems Platform Administration Manual*	805-7373
	Sun Fire 6800/4810/4800/3800 System Controller Command Reference Manual	805-7372

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CHAPTER 1

Sun Fire Product Overview

This chapter discusses the features and capacity of four Sun Fire™ servers:

- Sun Fire 6800 system
- Sun Fire 4810 system
- Sun Fire 4800 system
- Sun Fire 3800 system

This family of servers provides entry-level to high-end server functionality. The Sun Fire 6800 system has space for internal peripherals mounted within the 19-inch cabinet. You have the flexibility with the remaining three systems to install them in industry-standard 19-inch cabinets or have them preinstalled in a Sun Fire cabinet. The Sun Fire cabinet can hold one Sun Fire 4810 system, one Sun Fire 4800 system, or a maximum of three Sun Fire 3800 systems.

Standard Features

The standard features of these systems include:

- Rackmountable in industry standard 19-inch rack[1]
- Support for up to 24 CPUs and 192 Gbytes of memory
- Support for up to 32 I/O slots, PCI, and CompactPCI[2] I/O modules
- Extensive redundancy
- System controllers
- Support for multiple domains
- Concurrent hardware maintenance
- Common components
- Redundant power and cooling
- 9.6-Gbyte bus bandwidth

1. The Sun Fire 6800 system is not rackmountable, it comes already mounted in a cabinet.

2. CompactPCI I/O is available only in the Sun Fire 3800 system.

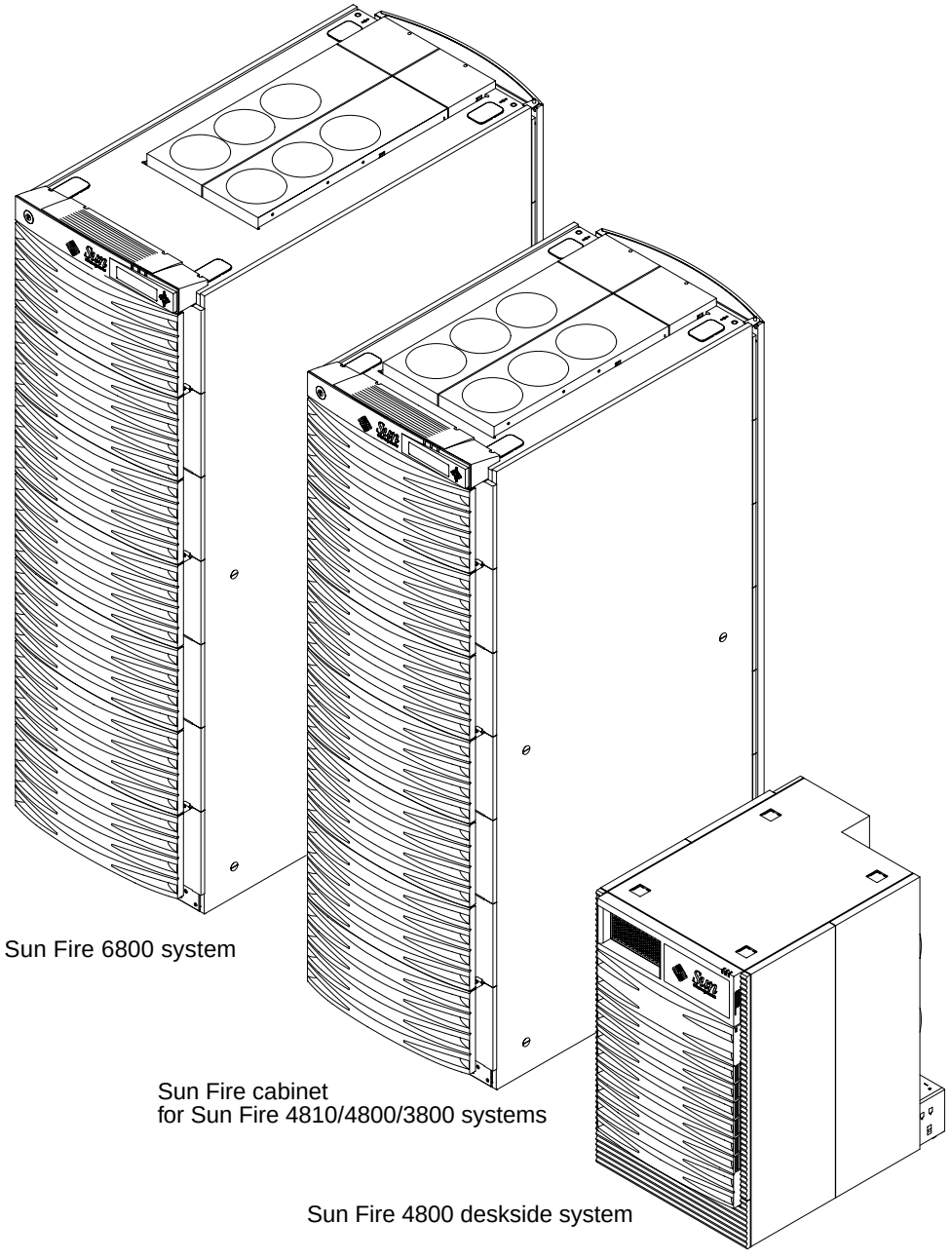

FIGURE 1-1 Sun Fire Systems and Sun Fire Cabinet

The Sun Fire family of servers, of which the Sun Fire 6800/4810/4800/3800 systems are members, share many common components, as shown in the following table.

TABLE 1-1 Sun Fire Shared Components

Components	Sun Fire 6800	Sun Fire 4810	Sun Fire 4800	Sun Fire 3800
CPU/Memory board	x	x	x	x
CPU processors	x	x	x	x
Memory DIMMs	x	x	x	x
PCI I/O assembly	x	x	x	NA
CompactPCI I/O assembly	NA	NA	NA	[1]
System Controller board	x	x	x	[2]
Repeater board	x	x	x	[3]

[1] The Sun Fire 3800 system only has CompactPCI I/O assemblies.
[2] The System Controller board for the Sun Fire 3800 system is unique.
[3] The Sun Fire 3800 system does not have Repeater boards.

Machine Configurations

Four machine configurations are available:

- Sun Fire 6800 system
- Sun Fire 4810 rackmountable system
- Sun Fire 3800 rackmountable system
- Sun Fire 4800 deskside or rackmountable system

Sun Fire 6800 System

The Sun Fire 6800 system has support for six CPU/Memory boards, four I/O assemblies, four Repeater boards and two System Controller boards. Although there are four Repeater boards, they are logically two redundant repeaters (two boards together make up one logical repeater). FIGURE 1-2 shows front and rear views of the Sun Fire 6800 system cabinet. TABLE 1-2 lists the features of the Sun Fire 6800 system.

TABLE 1-2 Sun Fire 6800 System Features

Features	Quantity or Description
CPU/Memory boards	6
CPUs	24
Maximum memory	192 Gbytes
I/O assemblies	4 (PCI)
System Controller boards	2
Repeater boards	4
Domains	4 maximum
Power supplies	6
Power requirements	200–240 VAC
Redundant cooling	Yes
Redundant AC input	Yes
Internal peripherals	None (However, space is available in the cabinet for peripherals options.)
Packaging	Sun Fire 6800 cabinet

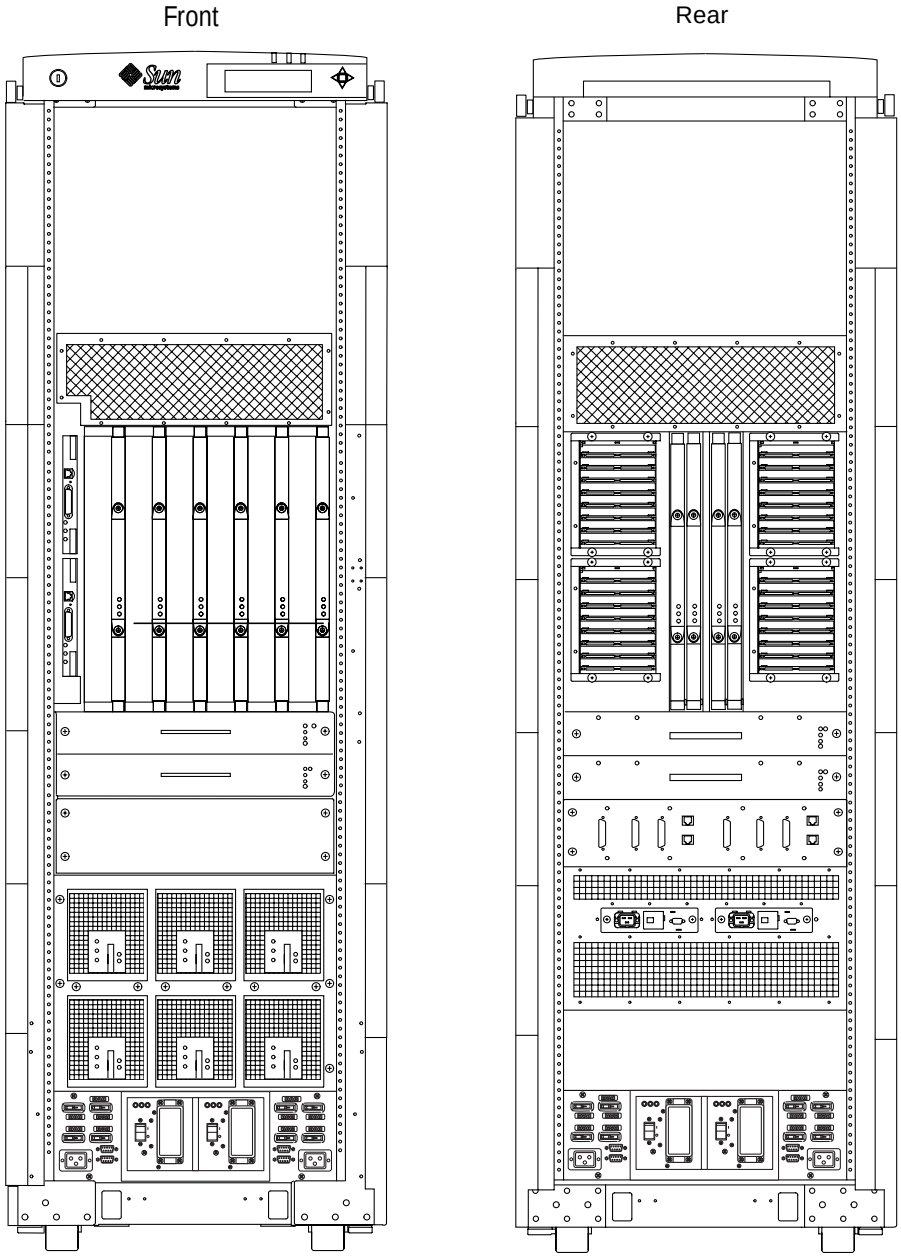

FIGURE 1-2 Sun Fire 6800 System Cabinet—Front and Rear Views

Sun Fire 4810 System

The Sun Fire 4810 system has support for three CPU/Memory boards, two I/O assemblies, two Repeater boards, and two System Controller boards. FIGURE 1-3 shows front and rear views of the Sun Fire 4810 system mounted in an optional Sun Fire cabinet. TABLE 1-3 lists the features of the Sun Fire 4810 system.

TABLE 1-3 Sun Fire 4810 System Features

Features	Quantity or Description
CPU/Memory boards	3
CPUs	12
Maximum memory	96 Gbytes
I/O assemblies	2 (PCI)
System Controller boards	2
Repeater boards	2
Domains	2 maximum
Power supplies	3
Power requirements	200–240 VAC
Redundant cooling	Yes
Redundant AC input	No
Internal peripherals	None
Packaging	Rackmountable or mounted in Sun Fire cabinet

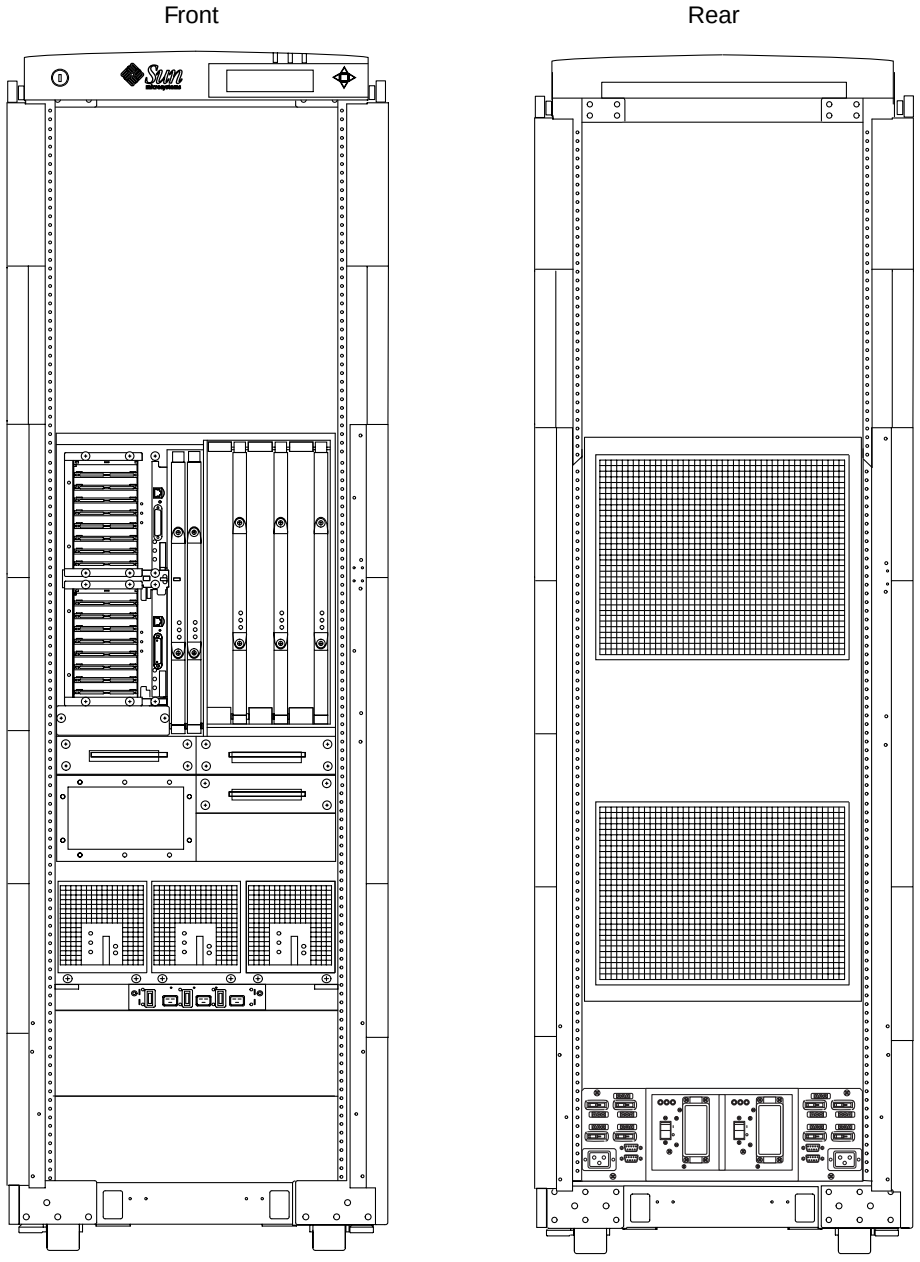

FIGURE 1-3 Sun Fire 4810 System Mounted in Optional Sun Fire Cabinet—Front and Rear Views

Sun Fire 4800 System

The Sun Fire 4800 system has support for three CPU/Memory boards, two I/O assemblies, two Repeater boards, and two System Controller boards. FIGURE 1-4 shows front and rear views of the Sun Fire 4800 system. TABLE 1-4 lists the features of the Sun Fire 4800 system.

TABLE 1-4 Sun Fire 4800 System Features

Features	Quantity or Description
CPU/Memory boards	3
CPUs	12
Maximum memory	96 Gbytes
I/O assemblies	2 (PCI)
System Controller boards	2
Repeater boards	2
Domains	2 maximum
Power supplies	3
Power requirements	200–240 VAC
Redundant cooling	Yes
Redundant AC input	No
Internal peripherals	None
Packaging	Rackmountable, deskside, or mounted in a Sun Fire cabinet

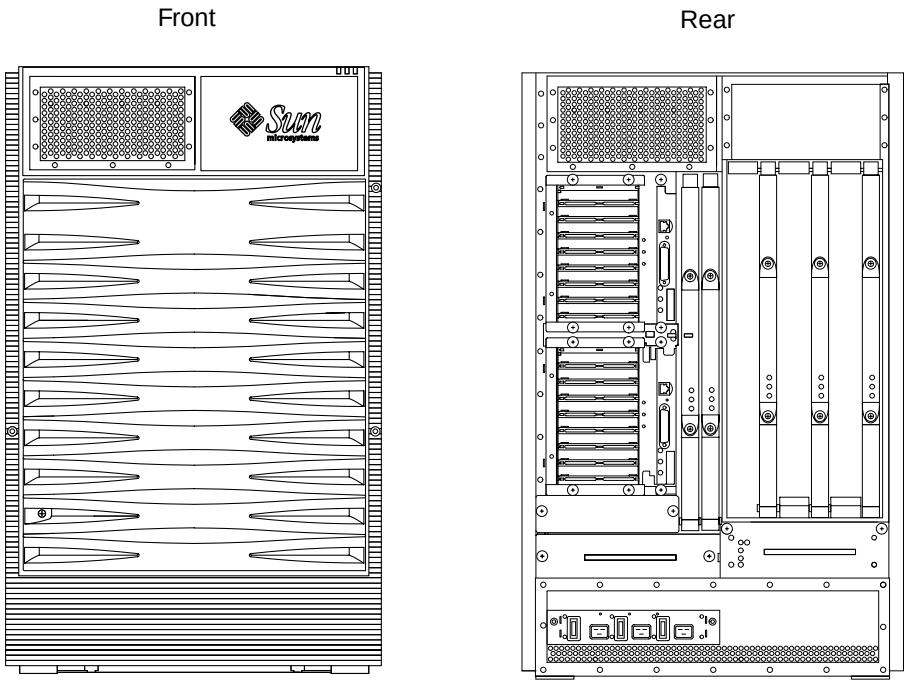

FIGURE 1-4 Sun Fire 4800 System—Front and Rear Views

Sun Fire 3800 System

The Sun Fire 3800 system supports two CPU/Memory board slots, two I/O assemblies, and two System Controller boards. The Sun Fire 3800 system is different from the Sun Fire 6800/4810/4800 systems in that it does not have Repeater boards, and uses a different System Controller board and I/O assemblies.

FIGURE 1-5 shows front and rear views of the Sun Fire 3800 system mounted in an optional Sun Fire cabinet. TABLE 1-5 lists the features of the Sun Fire 3800 base system.

TABLE 1-5 Sun Fire 3800 System Features

Features	Quantity or Description
CPU/Memory boards	2
CPUs	8
Maximum memory	64 Gbytes
I/O assemblies	2 (CompactPCI)
System Controller boards	2
Domains	2 maximum
Power supplies	3
Power requirements	100–120 VAC or 200–240 VAC
Redundant cooling	Yes
Redundant AC input	No
Packaging	Rackmountable or mounted in a Sun Fire cabinet

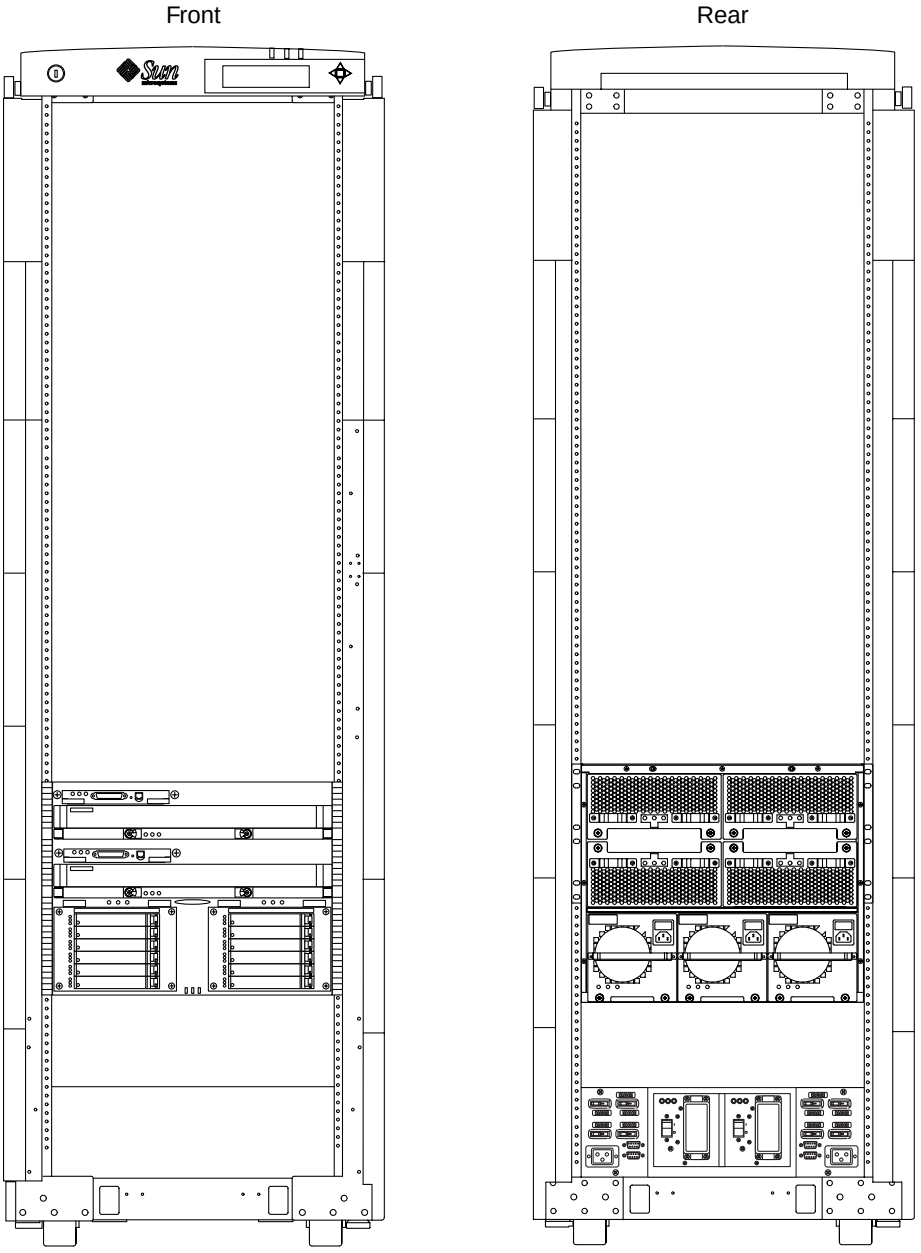

FIGURE 1-5 Sun Fire 3800 System Mounted in Optional Sun Fire Cabinet—Front and Rear Views

CHAPTER 2

System Features and Capabilities

The Sun Fire family of servers has features and capabilities that were not available on previous midrange systems. Primary features include the ability to partition your system and create domains. These features provide greater reliability, availability, and serviceability, which means uptime. These features and capabilities are as follows:

- *Partition*—The ability for the system to logically behave as two separate systems.
- *Domain*—The ability to create logically independent multiple sections within a partition, with each domain running its own operating system.
- *Reliability*—A function of the care with which the hardware and software design was executed, the quality of the components selected, and the quality of the manufacturing process (for example, ESD protection, clean rooms, and so forth).
- *Availability*—The percentage of time the customer's system is able to do productive work.
- *Serviceability*—The system ensures that repair time (downtime) is kept to a minimum.

Partitions and Domains

The Sun Fire system can be divided into partitions and domains. A single physical system can have multiple independent logical systems, each running its own operating system, by using partitions and domains. Partitions and domains differ only in terms of their flexibility and isolation.

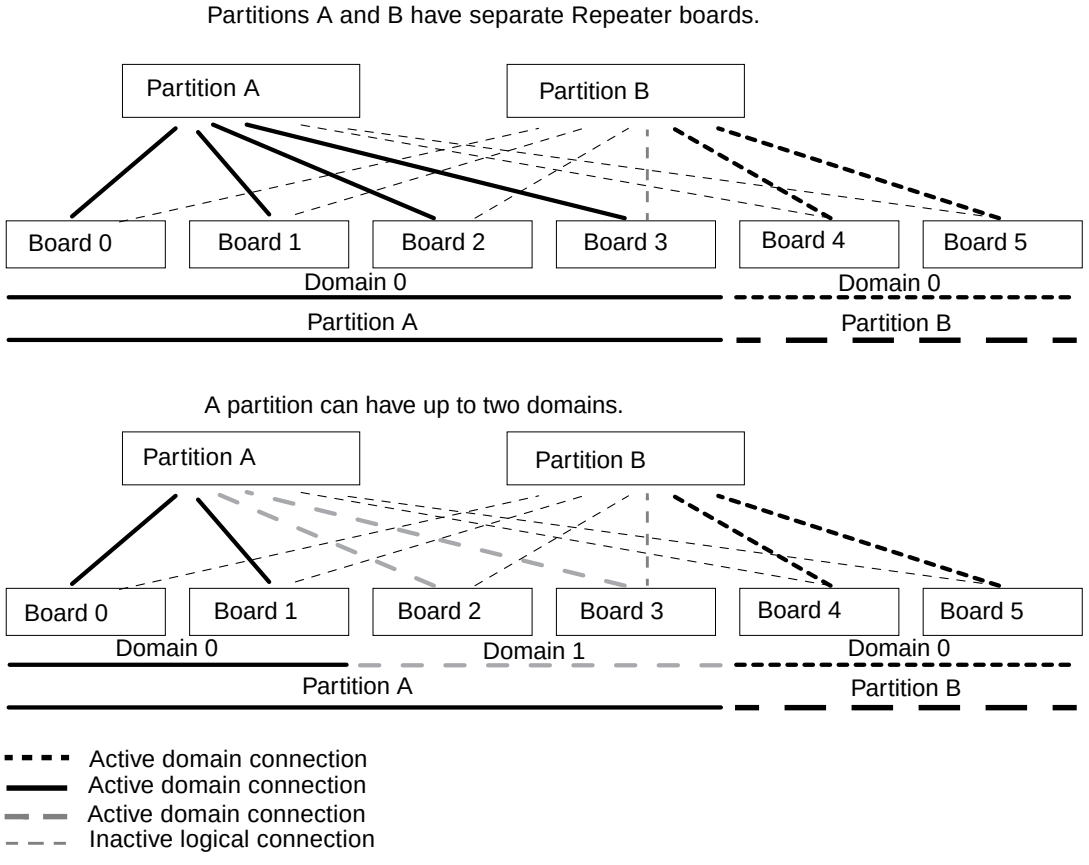

FIGURE 2-1 Partitions and Domains on a Sun Fire 6800 System

Partitions

A single physical Sun Fire 6800 system can be divided into two partitions. All connections between boards of one partition and boards of the other partition are disabled. The system logically behaves as two separate systems.

If the partitions are assigned to the physical half of the Sun Fire 6800 system, then the power planes associated with each partition are also isolated. A Sun Fire 6800 system can be divided into two partitions by logically isolating one set of Repeater boards for each partition. The Sun Fire 4810/4800/3800 systems also support two partitions.

Each partition on the Sun Fire 6800 system can have up to two domains, allowing for up to four domains total. For the Sun Fire 4810/4800/3800 systems, if a single partition is established, it can support two domains; if two partitions are established, however, each partition will support only one domain.

Domains

The Sun Fire system can be logically divided into multiple domains. Since each domain is comprised of one or more system boards, a domain can have between one and 24 processors. Each domain runs its own instance of the operating system and has its own peripherals and network connections. You can configure domains without interrupting the operation of other domains on the same system.

Domains can be used for:

- Testing new applications
- Operating system updates
- Configuring several domains to support separate departments

While production work continues on the remaining (and usually larger) domain, there will not be any adverse interaction between any of the domains. You can gain confidence in the correctness of applications without disturbing production work. When the testing work is complete, the system can be rejoined logically without rebooting (there are no physical changes when you use domains). Thus, if problems occur, the rest of your system is not affected.

The Sun Fire 6800 system can have up to four domains. The Sun Fire 4810/4800/3800 systems can each have up to two domains. Each instance of the Solaris Operating Environment runs in its own domain. Domains do not depend on each other and do not interact with each other.

A single partition on a Sun Fire 6800 system can be divided into two domains. Unlike partitions, domains share the Repeater boards. Each domain gets half the address bandwidth of a full system bus.

Reliability

The reliability capabilities of the Sun Fire fall into four categories:

- Reducing the probability of errors
- Correcting errors using error correcting code (ECC)
- Detecting uncorrectable errors
- Environmental sensing

Reducing the Probability of Error

All the ASICs are designed for worst case temperature, voltage, frequency, and airflow combinations. The high level of logic integration in the ASICs reduces component and interconnect count.

A distributed power system improves power supply performance and reliability.

Extensive self-test upon power-on reboot after a hardware failure screens all of the key logic blocks in the Sun Fire:

- Built-in self-test logic in all the ASICs.
- The power-on self-test (POST)—controlled from the System Controller board—tests each logic block first in isolation, and then with progressively more of the system. Failing components are electrically isolated from the centerplane. The result is that the system is booted only with logic blocks that have passed this self-test and that must operate without error.

All I/O cables have a positive lock mechanism and a strain-relief support to prevent accidental disconnections.

Correcting Errors Using Error Correcting Code

The Sun Fire system contains a number of subsystems that are capable of recovering from errors without failing. Subsystems that have a large number of connections have greater odds of failure. The subsystems that have the highest probability of errors are protected from transient errors through the use of single-bit error correction that uses an error correcting code.

Error Correcting Code Protection of the Data Interconnect

The entire data path from the local data crossbars and the memory subsystem is error correcting code protected. Single-bit-data errors detected in these subsystems are corrected by the receiving UltraSPARC™ III module, and the system is notified for logging purposes that an error has occurred.

The memory subsystem does not check or correct errors, but provides the extra storage bits. The Sun Fire data buffer chips use the error correcting codes to assist in fault isolation.

If a correctable error is detected by the interconnect, the system controller is notified and enough information is saved to isolate the failure to a single net within the interconnect system. The data containing the error is sent through the interconnect unchanged, and the error is reported.

Memory errors are logged by software so that defective DIMMs can be identified and replaced during scheduled maintenance.

Detecting Uncorrectable Errors

Almost all internal system paths are protected by some form of redundant check mechanism. Transmission of bad data is thus detected, preventing propagation of bad data without notification. All uncorrectable errors will result in an error condition. The recovery requires an operating system automatic reboot.

Multiple-Bit Data Errors

Multiple-bit ECC errors are detected by the receiving port, which notifies the operating system, so that depending upon what process is affected, the system as a whole can avoid failure.

Parity errors on external cache reads to the interconnect become multibit ECC data errors and are handled as other multibit errors.

Multiple-Bit Address Errors

Multiple-bit ECC errors detected in the address interconnect are unrecoverable and are fatal to the operating system.

System Time-Out Errors

Time-out errors detected by the port controller or memory controller are an indication of lost transactions. Time-outs are therefore always unrecoverable.

Power Corrected Failures

The Sun Fire system uses a highly reliable distributed power system. Each I/O subsystem, CPU/Memory board, System Controller board, or Repeater board within the system has DC-to-DC converters for that board only, with multiple converters for each voltage. When a DC-to-DC converter fails, the system controller is notified. The system board reporting the failure will then be deconfigured from the system. No guarantee is made regarding continued system operation at the time of the failure.

Environmental Sensing

The system chassis environment is monitored for key measures of system stability, such as temperature, airflow, and power supply performance. The system controller is constantly monitoring the system environmental sensors in order to have enough advance warning of a potential condition so that the machine can be brought gracefully to a halt—avoiding physical damage to the system and possible corruption of data.

Temperature

The internal temperature of the system is monitored at key locations as a fail-safe mechanism. Based on temperature readings, the system can notify the administrator of a potential problem, begin an orderly shutdown, or power off the system immediately.

Power Subsystem

The Sun Fire system performs additional sensing to enhance the reliability by enabling constant *health* checks. DC voltages are monitored at key points within the system. DC current from each power supply is monitored and reported to the system controller. The CPU power control will shut down any overheating CPU without shutting down the system.

The reset signals in the Sun Fire system is sequenced with the DC power levels to guarantee stability of voltage throughout the cabinet, prior to removing the reset signals and enabling normal operation of the Sun Fire system logic.

Availability

For organizations whose goal is to make information instantly available to users across the enterprise, high levels of availability are essential. This is especially true for a large shared resource system such as the Sun Fire system.

Availability Goals for the Sun Fire System

The Reliability, Availability, and Serviceability (RAS) goals for the Sun Fire system is to protect the integrity of the customers data and to maximize availability. The focus is on three areas:

- Problem detection and isolation—knowing what went wrong and ensuring that the problem is not propagated
- Tolerance and recovery—absorbing abnormal system behavior and fixing it, or dynamically circumventing it
- Redundancy—replicating critical components

To ensure data integrity at the hardware level, all data is error correction code (ECC) protected, and control buses are protected by parity checks out to the data on the disks. These checks ensure that errors are contained.

For tolerance to errors, resilience capabilities are designed into the Sun Fire to ensure that the system continues to operate, even in a degraded mode. Because it is a symmetrical multiprocessing system, the Sun Fire system can function with one or more processors disabled. In recovering from a problem, the system is checked quickly to determine the fault and to ensure minimum downtime. The system can be configured with redundant hardware to reduce downtime.

High Availability Capabilities of the Sun Fire System

The Sun Fire system capabilities raise its availability from the normal commercial category to the *high availability* category. These capabilities are grouped as follows:

- *Fault tolerant capabilities*—Any single point of failure is entirely transparent to users. Users see no loss of performance or capability in the specific areas of the system that are fault tolerant.
- *Resiliency capabilities*—These capabilities enable processing and data access to continue in spite of a failure, possibly with reduced resources. These capabilities usually require that you reboot your system.
- *Serviceability capabilities*—These capabilities lower or eliminate the repair time when a failure occurs.

Cooling

The Sun Fire system has redundant cooling. If one fan fails, the remaining fans automatically increase their speed, thereby enabling the system to continue to operate, even at the maximum specified ambient. Therefore, operation need not be suspended when a fan fails. Also, you can replace a fan while the system is operating, again without any adverse impact on the availability metric. Of course, the Sun Fire system has comprehensive and fail-safe temperature monitoring to ensure that there is no over-temperature stressing of components in the event of a cooling failure.

AC Power Supply

AC power is supplied to the Sun Fire system through up to four independent, 30-ampere, single-phase power supplies. Each AC input module carries power to two or three 1,280-watt bulk power supplies.

The AC connections must be controlled by separate customer circuit breakers, and can be on isolated power grids if a high level of availability is required. Optionally, third-party battery backed-up power can be used to provide AC power in the event of utility failure.

ECC

On the Sun Fire system, data errors are detected, corrected, and/or reported by the data buffer on behalf of its associated processor. Additionally, data errors passing through the interconnection will be detected and will cause a record stop condition for the ASICs. The ASICs detect and initiate this condition. These history buffers and record stop-condition bits can then be read and used by offline diagnostics.

Resiliency Capabilities

Resiliency capabilities enable processing and data access to continue in spite of a failure, possibly with reduced resources. These capabilities usually require that you reboot the system, and this is counted as repair time in the availability equation.

DC Power

The Sun Fire logic DC power system is modular at the system board level. Bulk 56-VDC is supplied through a circuit protector to each system board. This 56 volts is converted through several small DC-to-DC converters to the specific low voltages needed on the board. Failure of a DC-to-DC converter affects only that particular system board. You need to configure only as many bulk DC power supplies as are needed for the particular system configuration. The standard redundant configurations are three DC power supplies for up to three system boards and six DC power supplies for a maximum configuration on the Sun Fire 6800 system.

Logic Boards

The System Controller board contains the system controller interface as well as the clock source and the emergency shutdown logic. Optionally, you can configure two System Controller boards in the system for redundancy.

The Repeater, CPU/Memory boards, and the I/O subsystems hold the DC-to-DC converters that power the address repeater, the system data controller, the system data crossbar, and all other ASICs. If one Repeater board fails, the system will continue to operate in a degraded mode, which includes two of the four address buses and data buses.

Processor

If you have a failure of an UltraSPARC-III processor, the dual Ultra SPARC-III data switch, the external cache SRAMs, or the associated port controller, the failed processor can be isolated from the remainder of the system by a power-on self-test (POST) configuration step. As long as there is at least one functioning processor available in the configuration, the system can operate.

Memory

When POST completes testing the memory subsystem, any faulty banks of memory will be identified. POST can then reconfigure the memory configuration using only reliable memory banks, taking advantage of the highly configurable nature of the address-match logic in the memory controller.

Redundant Components

Both the customer mean time between failure and the customer availability measures of the system are enhanced by the Sun Fire system's capability to configure redundant components. There are no components in the system that cannot be configured redundantly if the customer desires. Each system board is capable of independent operation. The Sun Fire system is built with multiple system boards and is inherently capable of operating when only a subset of the configured boards are functional.

In addition to the basic system boards, redundantly configurable components include:

- System Controller boards
- Repeater boards
- Bulk power subsystems
- Bulk power supplies
- Peripheral controllers and channels

You can configure systems with multiple connections to the peripheral devices enabling redundant controllers and channels. Software maintains the multiple paths and can switch to an alternate path on the failure of the primary path.

The system controller is controlled though a console interface workstation. Redundant system controllers and interfaces can be configured if the customer desires.

Serviceability Capabilities

To reduce repair time, the Sun Fire system has been designed with a number of maintenance capabilities and aids. These are used by the Sun Fire system administrator and by the service provider.

There are several capabilities that enable service to be performed without forcing scheduled downtime. Failing components are identified in the failure logs in such a way that the field-replaceable unit is clearly identified. All boards and power supplies in a properly configured system can be removed and replaced during system operation without scheduled downtime.

Mechanical Serviceability

Connectors are keyed so that boards cannot be installed upside down. Special tools are *not* required to access the inside of the system. This is because all voltages within the cabinet are considered extra-low voltages (ELVs) as defined by applicable safety agencies.

No jumpers are required for configuration of the Sun Fire system. This makes for a much easier installation of new and/or upgraded system components. There are no slot dependencies other than the special slots required for the System Controller and Repeater boards.

The Sun Fire system cooling-system design includes capabilities that provide strength in the area of RAS. Standard proven parts and components are used wherever possible. Field-replaceable units (FRUs) and subassemblies are designed for quick and easy replacement with minimal use of tools required.

Bulk Power Supply Removal and Replacement

Bulk 56-volt power supplies can be hot-swapped with no interruption to the system. This assumes that the system is configured from the factory for power supply redundancy.

Fan Tray Removal and Replacement

If a fan fails, the remaining working fans are set to high-speed operation by the system controller in order to compensate for the reduced airflow. The system is designed to operate normally under these conditions until the failed fan assembly is serviced. The fan trays can be hot-swapped with no interruption to the system.

Domain Isolation

The Sun Fire system has an interconnect domain facility that enables the system boards to be assigned to separate software systems. For example, one domain can do production while a second domain experimentally runs the next revision of the operating system or exercises a suspected bad board with production-type work.

Nonconcurrent Service

Nonconcurrent service requires the entire system to be powered off.

Remote Service

Every System Controller board has remote access capability that enables remote login to the system controller. Through this remote connection, all system controller diagnostics are accessible. You can run diagnostics remotely or locally on deconfigured system boards while the operating system is running on the other system boards.

CHAPTER 3

Hardware Overview

The Sun Fire systems are a family of symmetrical shared-memory multiprocessors (SMPs).

You can view the Sun Fire systems at several functions of detail:

- Standard operation (simple SMP, OS functions)
- Interconnect (details of interconnect for OS boot and RAS features)
- Console bus interconnect (details of how the System Controller board controls the system)

Standard Operation

The standard operation is simply that of an SMP running an operating system with standard functions. It consists of CPU/Memory devices and I/O devices connected through an interconnect bus. Although the data interconnect is actually a crossbar switch, it is logically a bus. This is illustrated in FIGURE 3-1.

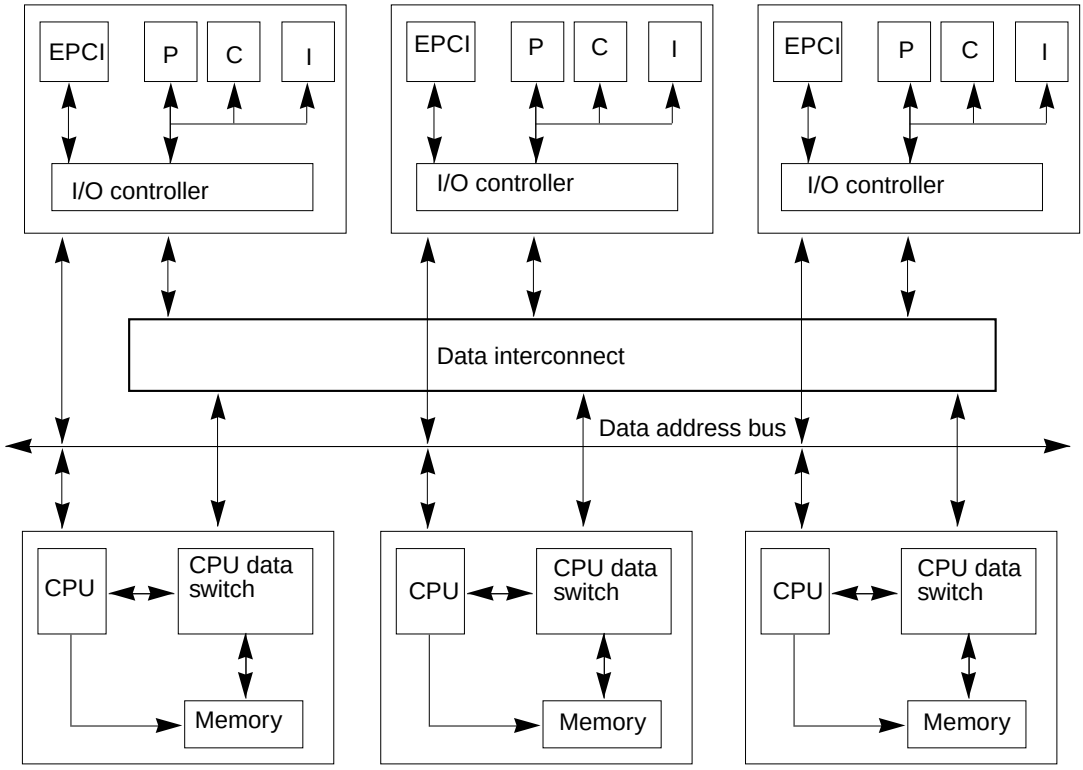

FIGURE 3-1 Standard Operation of the Sun Fire 6800/4810/4800/3800 Systems

Data Interconnect

Although the standard operation of the Sun Fire system is that of a simple “bus-like” interconnect, it is actually a point-to-point switched interconnect, with two levels of repeaters or switches.

The switch is capable of complex functions such as:

- Dividing the system into completely isolated partitions
- Dividing the partition into logically isolated domains

To boot the operating system and to exercise the functions listed above, the system controller needs to be aware of the logical structure of the switch interconnect.

The Sun Fire 6800 system has six slots for CPU/Memory boards. The Sun Fire 4810/4800 systems have three slots for CPU/Memory boards. The Sun Fire 3800 system has two slots for CPU/Memory boards. Each CPU/Memory board has up to four UltraSPARC III CPUs. The CPU also includes a memory controller, and each CPU can support one memory bank with up to eight DIMMs.

The Sun Fire 6800 system has four bays for the I/O assemblies. Two bays are included in the Sun Fire 4810/4800/3800 systems for I/O assemblies. The Sun Fire 3800 system has a CompactPCI only I/O chassis. Each PCI I/O assembly has two I/O controllers, each with one 66-MHz PCI bus and one 33-MHz PCI bus.

The Sun Fire 6800 system is designed to greatly improve reliability, serviceability, and availability (RAS) over previous generations of systems. The Sun Fire system is designed to be able to recover from any hardware failure. Some failure recovery will not impact users (for example, a power supply failure) if the system is configured for redundant power supplies. Some failure recovery (for example, a CPU failure) will require a reboot, and will impact users, but a properly configured system will always be able to recover from any hardware failure.

The address path and data path are treated in slightly different ways. The address path has two completely redundant repeaters. A complete address repeater path requires two Repeater boards, as the Address Repeater (AR) function is bit-sliced across two ARs. On the Sun Fire 6800 system, the data path is bit-sliced across all four Repeater boards for standard operation. Optionally, a single pair of Repeater boards can be used in “double-pumped” mode, so that full functionality, although with lowered data bandwidth, is retained.

The Repeater boards have active devices. Because centerplanes are relatively hard to service, the Sun Fire 6800/4810/4800 systems were designed so that no active devices are present on the centerplane. The Sun Fire 3800 system, however, incorporates all the active components onto its centerplane.

Console Bus Interconnect

The console bus enables the system controllers to read and write registers on the rest of the system. Only one of the two SCs can be master on the console bus at a time. Each system controller is connected to a console bus hub (CBH), and the two CBHs arbitrate for the use of the console bus.

CHAPTER 4

Sun Fire System Components

The Sun Fire 6800/4810/4800 systems share many of the same components. These components are the CPU/Memory boards, the I/O assemblies, the Repeater boards, and the System Controller boards. The Sun Fire 3800 system also shares the CPU/Memory boards, but uses different System Controller boards and I/O assemblies.

CPU/Memory Board

The CPU/Memory board is the same across the Sun Fire 6800/4810/4800/3800 systems. This board supports up to four UltraSPARC-III CPU modules, eight Ecache SIMMs, and eight banks of memory, two bank per CPU with four DIMM sockets per bank, for a total of 32 DIMMs.

All DIMMs must be the same capacity and sizes within a bank and must not be intermixed on a board.

All CPUs in the system must be the same clock speed for optimum performance. Mixed speeds are supported, but not at the board level. All CPUs on the board must be the same speed. The system will operate all CPUs at the lowest CPU speed in the system.

I/O Assemblies

The Sun Fire 6800/4810/4800 systems support only PCI I/O devices. The Sun Fire 3800 system supports only CompactPCI I/O devices.

PCI I/O

The I/O assemblies are logically and physically the same for the Sun Fire 6800/4810/4800 systems. The basic PCI I/O assembly will have six slots for standard PCI (33-MHz) device boards, plus two slots for PCI-66 (66-MHz) device boards.

CompactPCI I/O

The CompactPCI I/O assembly is designed for the CompactPCI form factor device boards. The Sun Fire 3800 system I/O assembly for CompactPCI supports a total of six slots.

Repeater Board

The Sun Fire 6800/4810/4800 systems are designed to be repaired and upgraded easier and faster than previous systems. This is due to the placement of active ASICs mounted on the Repeater boards. With two Repeater boards installed in the system, an alternate path is available through the second board, if one board fails. The Sun Fire 3800 system is the only system that comes with all of the active components of the Repeater board built onto the centerplane.

The Repeater boards provide two functions: redundancy for reliability, and a higher bandwidth. The system can operate with only one Repeater board. The Repeater board acts as a switch and connects multiple CPU/Memory and I/O boards together. The three components are the Address Repeater (AR), the Sun Fire data controller (SDC), and the data crossbar (DX).

In standard operation, the Sun Fire 6800 system has four Repeater boards which are used to route ten buses (six CPU and four I/O). If one of the Repeater boards fail, the system can continue to operate in a degraded mode with one pair of adjacent Repeater boards. The data width is cut in half and the two Repeater boards will route the ten buses.

Because the Sun Fire 4810 and 4800 systems support only two Repeater boards, the two Repeater boards operate together to route five buses (three CPU and two I/O). If one of the Repeater boards fail, the data width is cut in half and one Repeater board can route the five buses.

System Controller Board

The System Controller board contains the system clock and a service processor. One System Controller board is required per system. You can install one additional System Controller board for redundancy in all the Sun Fire systems. The Sun Fire 6800 system comes standard with two System Controller boards installed at the factory. The processor on the board is a microSPARC™ IIep with its own POST/OBP flash PROM and 8 Mbytes of DRAM. The processor also has a 33-MHz PCI bus with two devices on it.

With two System Controller boards in each system, if one System Controller board fails, the other System Controller board can take control of the system without causing a disruption in the main system operation. The System Controller board has a 10/100-BASE-T Ethernet connection and an Ebus interface for a variety of devices. These include a TOD/NVRAM device, flash PROM for extra NVRAM space, a large (4 Mbyte) flash PROM to hold the OS code, and one 16552 dual serial port device.

The System Controller board performs the following main functions:

- Sets up the system and coordinates the boot process
- Generates system clocks
- Monitors the environmental sensors throughout the system
- Analyzes errors and takes corrective action
- Sets up the system partitions and domains
- Provides the system console functionality

The major features of the System Controller board are:

- Redundant system controller
- Virtual domain key switches
- Network Solaris software console for each domain
- Virtual time-of-day for each domain
- Environmental monitoring

The system controller provides five ports: domain A console, domain B console, domain C console, domain D console, and the system controller shell. The system controller shell provides the following:

- Configuration control
- Environmental status
- Ability to reconfigure domains
- Ability to power on and off power grids
- Ability to change the system controller password
- Other generic system controller functions

The system controller software sequences the booting of the system by:

- Configuring hardware
- Setting up domains
- Powering on and off components (such as system boards, power supplies, and fans)
- Testing components
- Building the domains

The system controller software provides tools for changing the configuration of the system, and it also logs errors.

For more information on the system controller, refer to the *Sun Fire 6800/4810/4800/3800 System Controller Command Reference Manual.*

Redundant System Controllers

When two System Controller boards are installed in Sun Fire 6800/4810/4800/3800 systems, the second board is a redundant System Controller board. Each System Controller board can check the health and status of the other System Controller board. If the main System Controller board (SC0) fails, the redundant System Controller board (SC1) takes over operations without causing a disruption of the system operation.

Virtual Domain Key Switches

The system controller provides a virtual key switch for each domain. The `key switch` command controls the position of the virtual key switch for each domain.

Solaris Console

The system controller provides a Solaris software console for each domain. The Ethernet or serial port of the System Controller board is the physical connection for the Solaris software console. The serial port can support only one console at a time. However, the Ethernet port can support many consoles simultaneously. The system controller multiplexes these physical connections to provide console services for each domain and for the system controller.

Virtual Time Of Day

The Sun Fire TOD/NVRAM chip is located on the System Controller board. The system controller multiplexes the physical TOD chip to provide TOD services for each domain and for the System Controller board. The system controller also provides for synchronizing the TOD between the main System Controller board and the redundant System Controller board.

Environmental Monitoring

The Sun Fire system has a large number of sensors that monitor temperature, voltage, and current. The system controller polls these devices periodically. If thresholds are exceeded, the system controller shuts down various components to prevent damage.